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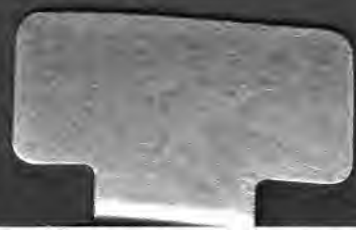
DEPARTMENT OF COMMERCE AND LABOR
BUREAU OF MANUFACTURES
JOHN W. CARSON, Chief

MUNICIPAL ART COMMISSIONS
AND
STREET LIGHTING IN EUROPEAN
CITIES

SPECIAL CONSULAR REPORTS
Vol. XLII—Part 1.



WASHINGTON
GOVERNMENT PRINTING OFFICE
1910



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LETTER OF SUBMITTAL.

DEPARTMENT OF COMMERCE AND LABOR,
BUREAU OF MANUFACTURES,
Washington, March 23, 1910.

SIR: I have the honor to submit herewith two series of special consular reports, the first dealing with municipal art commissions and the second with the methods of street lighting, in European cities, both of which were prepared in compliance with requests for information on these subjects. Of the 100 reports prepared by consuls on the work of municipal art commissions, a small number have been selected for publication, as setting forth typical conditions in European cities and typical methods of meeting them. The reports on street lighting in Berlin, Brussels, London, Paris, and Vienna cover such points as the character of the lights in the most prominent streets of these cities, their number, location, distance apart, illuminating power, and cost per year.

Respectfully,

JOHN M. CARSON.
Chief of Bureau.

TO HON. CHARLES NAGEL,
Secretary of Commerce and Labor.

MUNICIPAL ART COMMISSIONS.

INTRODUCTION.

The work of commissions established to pass upon all gifts to municipalities, such as statues, monuments, fountains, and the like, is the subject of a series of reports from consular officers stationed in European cities, and the reports bring out many features of value to those interested in the beautification of American cities. The acceptance and supervision of such gifts have been provided for in various ways, although there is a general uniformity in the methods employed not only in the cities in each country but also in all of the European municipalities.

Primarily the power to accept or reject and to provide for the care and maintenance of such gifts is vested in the governing officers corresponding to the mayor and municipal council of American cities. In most countries they are held responsible, not only for the financial obligations that may be involved by the city in the acceptance of gifts but also for their artistic merit or lack of merit. In most cities there are laws governing the financial features, but the passing of judgment on the esthetic value of gifts oftentimes presents a difficult problem to officials but little versed in art.

It is this lack of expert knowledge that has led the city councils to seek advice and aid outside their own membership. Artists, sculptors, painters, architects, directors of art institutions, and others competent to pass judgment are called into consultation. And this resulted in the formation of either temporary or permanent art commissions such as now exist in some of the European cities. Generally these commissions act only in an advisory capacity, although their judgment may never be questioned, and may be considered final. In some cities, however, they are clothed with the authority usually vested in the governing bodies.

In the reports that follow illustrations of the various methods of meeting the problem are given. Of the 100 cities from which reports were received the great majority have no art commissions, and the acceptance or rejection of gifts is in the hands of the mayor and city council, who, it is generally stated, are wont to seek advice from competent persons outside their membership when the question of artistic merit is raised.

FRANCE.

METHODS OF NAMING COMMISSIONS—SYSTEM IN PARIS.

In French cities the usual method followed by the city councils, to which is given the power to accept or reject gifts, is the appointment of an art commission, consisting sometimes of its own members and sometimes of others specially qualified for such duties. This commission may be temporary or permanent. Where the city has in its employ an official known as the inspector of fine arts, he is called into consultation.

Paris has a permanent commission, the work of which is described by Consul-General Frank H. Mason, of that city, as follows:

All propositions of gifts to the city are referred to what is known as the fourth commission, a permanent board which is composed of 16 members of the municipal council, and has for its field subjects relating to certain schools and courses of instruction, the municipal library and historical museum, the acquisition of works of art, and of all subventions and subscriptions for these various purposes. When this commission has under consideration the acceptance of a statue, monument, or other work of art offered as a gift to the municipality, it consults an official expert, the inspector of fine arts for the city of Paris, who is a permanent official of the municipal government. His opinion is of important weight in determining the verdict of the fourth commission as to the acceptability of a proffered work of art, and in case of a favorable decision the question is then brought by the commission for formal action before the full municipal council.

COMMISSIONS APPOINTED AS NEEDED IN HAVRE.

In Havre the commissions are appointed by the mayor as occasion may arise. Consul Alphonse Gaulin, of that city, describes their work as follows:

These commissions report on the artistic value of the gifts in question and on the pecuniary and other consequences that would follow an acceptance thereof. The commissions are chosen among the members of the community best qualified to act as judges in such matters, namely, distinguished painters, sculptors, art teachers, and critics, architects, and other competent persons. In recent years the director of the local museum of fine arts, who is also at the head of the Havre School of Fine Arts, has figured on every commission.

While the final decision lies with the municipal council, the recommendations of the commissioners have almost invariably been adopted without any material modifications. This fact alone demonstrates in a striking manner the excellence of the selection made in each case.

DUTIES OF THE COMMISSIONS OF FINE ARTS.

In some French cities there is a permanent organization known as the commission of fine arts, appointed by the mayor, in whose charge are placed the various art institutions, parks, etc., and the super-

vision of gifts to the city naturally falls to this board. The duties of such a commission are outlined in a report from Consul Louis Goldschmidt, of Nantes, who states:

In this city there is a commission appointed by the mayor, which has charge of all questions regarding the supervision of gifts to municipalities. The commission is the Commission des Beaux Arts. Its duties are to look after the engagement of artists for the municipal theaters, which receive a subsidy from the municipality. It also has charge of the museum of fine arts, the purchase and acceptance of gifts of pictures or statuary, etc., for the same; the maintenance of parks, public gardens, squares, etc.; the acceptance of gifts of statues, etc., and the placing of them in appropriate localities; the municipal school of fine arts; the conservatory of music; and the public libraries.

GERMANY.

DUTIES OF THE ART DEPUTATION IN BERLIN.

Various methods prevail in German cities, final power generally being vested in the municipal council or board of aldermen. The latter may, and generally do, seek advice from competent city officials, such as municipal architects, and from other experts. In Breslau and Hanover there are permanent commissions or deputations placed in charge of such work.

The method followed in Berlin is described by Vice-Consul-General Frederic W. Cauldwell, of that city, as follows:

For the consideration of such gifts the magistrat (municipal corporation) of Berlin appoints an art deputation, consisting of 17 members. On this deputation are 2 of the city burgomasters, 2 architects, and 1 more member chosen by these 4; 10 members of the city council, appointed by that body, and 2 private citizens, 1 a sculptor, and 1 a painter.

This deputation passes an expert opinion and reports its decision to the chief magistrate of the city. There are no regulations regulating the mode of procedure. If the gift is of sufficient importance the art deputation is called into special session. Otherwise the matter is referred to any future session. The sessions are irregular, being regulated by circumstances.

INFLUENCE OF ART SOCIETIES IN BRUNSWICK—BUILDING LAWS.

The city government of Brunswick depends upon the advice of the municipal architect, museum directors, and other authorities in art, and private art societies, as is shown by the following report from Consul Talbot J. Albert, of that city:

There exists in Brunswick no commission authorized to pass upon gifts of statues, monuments, fountains, and the like to the municipality. In such cases the city government has hitherto depended upon the advice and judgment of the municipal architects and building experts. Museum directors and like authorities in art are consulted. At the same time the critical opinions of private art

societies when given are respected. On occasions when it deems proper the Brunswick Duererbund, an association of persons interested in art, has interposed its opinion as to the value of such gifts as works of art and fortified it with the judgment of a number of professional experts, whose services it can secure. This association has repeatedly made its influence effective.

There are two other societies in Brunswick whose fields of activity may interest those concerned in municipal embellishment. The commission for the preservation of ancient monuments does excellent work in the preservation of works of antique art, such as buildings, public and private, which are fine specimens of mediæval architecture. Its labors have contributed to the attractiveness of the city and will be of benefit and instruction to future generations.

Another art society interested in the beautifying and embellishment of the city is called the Garden Culture Union for the Duchy of Brunswick. The work of this society has been eminently successful in giving a beautiful appearance to streets in spring, summer, and autumn.

In Brunswick and, as a rule, in all German cities, the building laws are strict. Persons are not allowed to erect buildings constructed entirely according to their own architectural ideas. Plans and specifications must be submitted to the construction department of the city government, where they are carefully scrutinized. The structure must harmonize with the character of the buildings allowed to be, or already constructed, on the street or square, and no license will be granted until the building is approved in all respects in manner of height, architectural effect, etc.

Harmony, not similarity of structure, is sought. Buildings which offend the eye and of dull uniformity are, as far as possible, avoided. The result of this strict supervision is that the streets are improved with a class of buildings suitable to them, and the location of statues, monuments, fountains, and the like in public squares is respected, and structures, as far as possible, are not permitted to be erected which will detract from their beauty.

CHEMNITZ TO HAVE A PERMANENT COMMISSION.

The Chemnitz city council has recently decided to appoint a permanent art commission, which will have supervisory powers over all features of municipal life where artistic and esthetic factors come into consideration. The method heretofore followed in dealing with gifts to the city is described by Consul Thomas H. Norton, as follows:

The city of Chemnitz receives a large number of gifts in the course of each year, chiefly, however, in the form of money for the endowment of charitable objects. The public spirit of its citizens rarely finds expression in the form of donations for the purpose of increasing the decorative and memorial features of the municipality.

When such a gift is proposed, for example, the sum necessary for a fountain, the matter is first submitted to the city council. If approved, the gift is accepted and the fund is paid into the city treasury. The department of construction is next called upon to

submit appropriate plans. In this connection it is customary to call to the assistance of the municipal bureau, one or more persons competent to give professional and artistic counsel, unless the whole project is made the subject of a prize competition. In such case the city council acts as a jury in deciding upon the plans submitted.

It is to be noted that, as in most German cities, the Chemnitz city council contains a number of highly educated men, fitted by training and experience to pass upon the artistic merits of projects of a public nature.

Still the desirability of securing authoritative professional opinion on matters of this kind is fully recognized. A commission of experts was appointed to superintend the planning and construction of the stately new opera house of Chemnitz. A similar commission was selected also to oversee the building of the city art museum, now nearly completed.

FUNCTIONS OF PERMANENT COMMISSION IN BRESLAU.

In Breslau there is a permanent municipal art commission, the work of which is described by Vice-Consul Richard Wackerow, of that city, as follows:

The municipal art commission consists of three members of the magistrat and five aldermen independently, and it decides about the production of works of art for decoration of the city, especially for that of public parks, streets, places, and buildings. At the disposal of this commission for procuring such works of art are the means of the art fund, fixed by annual appropriation. So far as a place for works of art comes in consideration, the permission of the magistrat and the board of aldermen has to be procured. The commission would have also to decide about the gift of a work of art, so far as artistic questions are concerned; the acceptance of a donation is reserved to the city authorities, magistrat and board of aldermen.

If a public monument is not erected at cost of the community, as a rule, the art commission first decides about the designation of the place for the erection of the monument, and its acceptance for permanent maintenance; the decision of the commission has to be passed upon by the magistrat and the board of aldermen; but the permission can also be given without the cooperation of the art commission.

HANOVER'S COMMISSION GIVEN COMPLETE AUTHORITY.

Hanover has a regular legal commission with final authority over various features of municipal beautification. Consul Robert J. Thompson, of that city, describes its work as follows:

The city of Hanover has had since 1897 a regular legal commission, not only with advisory powers, but possessing final authority for the control and care of monuments belonging to or which may be given to the city. It is the duty of this commission to pass upon the acceptability of such gifts, judgment being rendered according to the historical, allegorical, or artistic merit and significance of the offering.

It also controls the matter of city decorations on fête days or festal occasions, as well as decorations made by private concerns or parties. Designs for buildings, public or private, must be submitted to this commission before building permits can be obtained.

The commission is composed of four members of the city council, with the director of the principal museum, the city recorder, two architects of the department of public works, and one local private architect.

Hanover, like all continental cities, is fully alive to the more than esthetic value of municipal art. The heads of the city's several departments, such as buildings, street cleaning, public parks, municipal art, sanitation and public health, etc., are paid experts of demonstrated ability. The cities of Germany bid for these men and make contracts with them the same as a corporation engages its manager, for a period of years. There is no such thing as political popularity controlling or influencing these selections. Previous record, results, and the ability of the city to pay the salaries are the governing influences in the selection of its officials, and this rule generally prevails from the mayor downward.

ITALY.

CITY COUNCILS SELECT COMMISSIONS IN ROME AND MILAN.

Authority to accept or reject gifts to the municipality is vested in most of the cities of Italy in the mayor and city council. There are in a number of cities, however, art commissions that pass upon the merits of such gifts as may be proffered. There is no uniform method throughout the country of selecting these commissions, and the reports that follow show how various cities have worked out the problem. Consul Chapman Coleman, of Rome, reports as follows on the system in vogue in that city:

The commission that passes upon all gifts, such as statues, monuments, fountains and the like, to the municipality of Rome, consists of the mayor, acting in conjunction with the giunta municipale. The giunta municipale is composed of the aggregate body of assessors, who preside over the various subdivisions of the city government, and are chosen by the city council (itself elective) from its own membership, to represent that body in the executive department of the municipality of Rome.

Milan has a permanent art commission, which Vice-Consul John Q. Wood, of that city, describes as follows:

Milan has a commission of 14 members to pass upon all gifts, such as statues, monuments, etc., to the municipality. These members are elected by the city council for a term of three years and are not eligible for reelection until a year has elapsed after the expiration of their term. In the selection of this commission, which serves without pay, the city council is careful to elect only persons who have special qualifications adapted for efficient service in the particular field which claims the commission's attention.

METHODS FOLLOWED IN FLORENCE, LEGHORN, AND VENICE.

All gifts made to the city of Florence, Consul Jerome A. Quay, of that city, states, are examined by the municipal commission of fine arts and antiquities. This commission is appointed by the municipal board and is made up of prominent artists, historians, and critics, and is presided over by the mayor of Florence, who issues a call whenever a meeting is necessary.

In the city of Leghorn there is a commission to pass upon all gifts to the municipality, such as statues, monuments, etc., reports Consul Ernest A. Man, of that city. This commission consists of prominent artists, lawyers, professors, and merchants, the president of which is the prefect of the province. There is also a commission consisting of artists and prominent professional people to pass upon the gifts to public museums and picture galleries, of which the mayor of the city of Leghorn is president.

Venice has no specific committee charged with the supervision of gifts to the city for public adornment or utility. The method followed in dealing with such gifts is stated by Consul James Verner Long, as follows:

When a gift for public adornment or utility is bestowed upon the commune, its acceptance is arranged for by the municipal council, with the cooperation of the syndic, or mayor of the city. Should such gift prove of an exceptionally pretentious or important nature, then a special municipal committee is appointed by the council of Venice, which is empowered to receive and control the gift in the name of the municipality.

A permanent committee of seven members does exist, however, in Venice for the supervision and direction of any changes or restorations that may be made in any of the monuments, buildings, or churches, and if such change or restoration is proposed by private, local, or foreign expense or donation the said committee deliberates as to the feasibility of such improvements to be undertaken and decides the proposition of acceptance.

UNITED KINGDOM.

SYSTEM IN SOUTHAMPTON TYPICAL OF ENGLISH CITIES.

Consul Albert W. Swalm, of Southampton, describes the causes leading up to the present method of dealing with the problem in England and the system followed in that city, which is typical of that in all British municipalities. He says:

The subject of gifts to municipalities in England was made a matter of parliamentary inquiry and action in the time when the general acts were passed touching towns, cities, and boroughs more than fifty years ago, and the rules and powers then granted practically govern to-day. It was found in that earlier day that all sorts of gifts in the way of monuments, more or less atrocious when considered artistically, fountains for man and beast, memorials of brave things badly

commemorated in stone or marble were erected in public places, and there stood, ghastly reminders of public or private generosity gone wrong.

The new acts, however, generally put an end to that sort of thing, and the borough councils were made responsible for the erection and care of all these things created in votive or commemorative way, whether by public subscription or private generosity. These councils were made fully responsible for these constructions in an artistic way, as well as in the future care of the same. So all such work had to have the warrant of favorable action of the committee on highways; if in the parks, that of the committee in charge of the same; on harbor lines, the harbor board had authority. All sketches and plans had to be submitted to committee action. If favored, then the full council was called on to approve or to reject, and thus combined good judgment was secured. In several cases, in fact, in all cases, consultative opinion was asked of competent art judges, so that fancy might be well founded in artistic fact.

Under these conditions in Southampton monuments to Isaac Watts, who was born here, to Gen. George Gordon, to Lord Palmerston, to Burgess and Mayor Richard Andrews, five times chosen mayor, and several fountains have been erected. These memorials are now legally vested in the borough of Southampton, having been accepted in due form at the time of their dedication. This acceptance carries with it complete care on the part of the corporation, and no one can have anything to do with it in any sense whatever save by authorized action on the part of the council.

In addition to this element of care by combined and well-considered action comes the usual long service of gentlemen in these public places who are wholly uncompensated and who take a very high civic interest in the work with which their fellow-burgesses have intrusted them. And in that work they apply care and judgment, calling in friendly aid and advice, when they deem it needed, in order that good work of lasting quality in both art and material may be taken over.

INFLUENCE OF ART INSTITUTIONS.

In cities that have art museums, the influence of the latter on the merit of gifts to the municipality is quite marked. Consul Albert Halstead describes this in his report from Birmingham, as follows:

While there is no commission, in the strict sense of the word, in Birmingham to pass upon gifts such as statues, monuments, fountains, and the like to the municipality, this does not mean that such gifts are not carefully supervised with reference to their artistic merit. The public works committee of the city council of the corporation of Birmingham supervises all such gifts, and before passing upon them is accustomed to take the advice of art experts, such as the director of the Birmingham Museum and Art Gallery.

Birmingham has a splendid art museum filled with art treasures, the gifts of those interested or purchased by money donated for that purpose. This art museum is under the control of the city council through a museum management committee which is composed of the lord mayor, seven members of the city council, and eight gentlemen, citizens of Birmingham, who are selected by the council because of

their knowledge of art and interest in it. This committee, after consultation with the director, passes with great care upon all proposed gifts to the museum. As a result, pictures, statuary, and curios, and all other artistic articles that get into the museum have a distinct artistic value. Gifts and bequests of pictures and the like that are not artistic are declined tactfully. Such declinations are not infrequent, the supervision both of gifts to the art museum and of statues, monuments, fountains, and the like by two committees of the city council preventing much that is undesirable and inartistic being accepted.

OTHER COUNTRIES.

CITY COUNCILS GENERALLY SEEK ADVICE OF EXPERTS.

In Austria-Hungary methods similar to those in vogue in countries already treated are followed. The city council seeks the advice and aid of such experts as are in the municipal service, the directors of art institutions, private art associations, and others competent to pass judgment on the merits of the proposed gift.

In Spain the decision generally rests with the city council, but in Madrid all gifts to the municipality, of whatever nature they may be, must be referred to the minister of public instruction who, in turn, submits the proposal to the committee on fine arts, whose decision in the premises is accepted.

Cities in other countries from which reports were received, including Norway, Sweden, Netherlands, Belgium, Denmark, Switzerland, Greece, Russia, Roumania, and Turkey, have no methods of dealing with gifts to the municipality differing in essential features from those already given.

METHODS OF STREET LIGHTING.

BERLIN.

By VICE-CONSUL-GENERAL ARCHIBALD DORMAN.

According to the latest published statistics the total length of lighted streets in Berlin is 515 kilometers (320.1 miles). This area is lighted principally by gas and electricity. There is, however, an inconsiderable number of petroleum lamps still in use. The streets lighted by gas greatly exceed in number and length those lighted by electricity, the excess of gas used being much greater in Berlin than in most other large cities. However, considering that Berlin is one of the best-lighted cities in the world, the system employed here is one of great interest to other large municipalities.

Three types of gas lamps are used in lighting the streets, namely, common gas lamps, compressed-gas lamps, and the low-pressure gas lamps with inverted burners (*niederdruck invert licht*). Of these three types, the common gas lamp is of first importance in respect to the number of streets lighted, since 418 kilometers (259.8 miles), or four-fifths of the total length of lighted streets, are illuminated by this means. The lamps are distributed along both sides of the streets, 26 meters (85.3 feet) apart, measured diagonally from the lamp on one side to the lamp on the other, although this distance is not always uniform. At most street crossings a lamp is placed on each of the four corners, and occasionally at other places the distance of 26 meters is somewhat reduced. If one takes the distance given above as a basis, five common gas lamps would be required on a block or street having a width of 15 meters (49.2 feet) and a length of 91.5 meters (300 feet).

COMMON GAS LAMPS.

The total number of common gas lamps—that is, those burning under normal pressure and equipped with Welsbach burners and mantles—used on public streets is 28,566, of which there are 16,184 having one flame, 12,162 with two flames, 204 with three flames, and 16 with four flames.

Seven-tenths of the radius of the horizontal circle of illumination is considered the proper elevation for the most effective street lighting. The common gas lamps are for this reason placed 3.7 meters (12.14 feet) above the surface of the sidewalk. These lamps have a power varying from 80 to 240 Hefnerkerzen (70.17 to 210.5 candlepower), according to the number of flames, and burn 1.5 liters (0.053 cubic foot) per hour for 1 H. K. (0.877 candlepower). The mantles for the burners generally last about thirty days, the average being 10.6

mantles per year for each lamp. The chimneys may be used for one hundred and thirty days, 2.8 chimneys being reckoned for the year.

The chief objection to the common gas lamp is the relatively small power obtained in proportion to the consumption of gas and its poor diffusion of light. The greatest radiation is given out within an angle of 10 degrees measured from the perpendicular plane.

HIGH-POWER COMPRESSED-GAS LAMPS.

Compressed-gas lamps of high power are employed in lighting 42.3 kilometers (26.3 miles) of the more important streets of the city. This type of lamp has proved to be so successful that it is now gradually supplanting other types on streets on which traffic is heavy and which are required to be especially well lighted. The pressure under which the gas burns varies according to the particular make of the lamp, although the average pressure employed for street lighting is 1,400 millimeters (55.1 inches) of water column.

This lamp is especially recommended on account of the brilliancy of its light and the excellent diffusion of the rays emitted. The greatest radiation is given out at an angle of 40 or 45 degrees below the horizontal plane of the lamp, and is weakest directly beneath it. By this wide diffusion of the light rays a street may be uniformly lighted, and the alternating shadows and bright spots common to many streets are largely eliminated. Compressed-gas lamps are distributed 32 meters (105 feet) apart at an elevation of 5.7 meters (18.7 feet) above the street pavement. According to this distribution there are within a distance of 300 feet 4 lights, varying in power from 1,000 to 4,000 H. K. (877.2 to 3,508 candlepower).

On one of the principal thoroughfares of Berlin, extending from Leipziger-Platz to Brandenburger Tor, compressed-gas lamps of the maximum power are employed, distributed 30 meters apart, measured diagonally from one side to the other. Each of these lights has 3 burners, 2 of which are extinguished at midnight, the other being left to burn until daybreak. The older compressed-gas lamps consume 0.7 liter (0.0237 cubic foot) of gas per hour for each H. K. (0.877 candlepower) when burning under average brilliancy. This amount has been reduced by 25 per cent in the newer compressed-gas lamps, which consume from 0.42 to 0.5 liter (0.0147 to 0.0176 cubic foot) under the same conditions. The older lamps have either 2 flames, and consume 600 liters (21.18 cubic feet) per hour, or 3 flames, with a consumption of 800 liters (28.24 cubic feet). The new lamps are equipped with either 1, 2, or 3 flame burners, and have a strength of 1,000 (877.2 candlepower), 2,000 (1,754.4 candlepower), or 3,000 H. K. (2,631.6 candlepower), respectively.

A compressed-gas burner requires a new mantle every seven days, although the length of time can not be given exactly, as at present it is thought that the durability of a mantle will prove to be much longer than formerly. The care of the lamps usually requires one man for every 50 lamps. It is the duty of those who are assigned this work to keep the globe clean, renew the mantle, and to regulate the burners. The cost of caring for the lamps during the year 1908 averaged 19.42 marks (\$4.62) apiece; the cost of maintenance was 71 marks (\$16.90), making a total of 90.42 marks

(\$21.51) for care and maintenance. The lamps are lighted and extinguished automatically by change of gas pressure, unless it is desired to put out one flame before the others. The 42.3 kilometers (26.3 miles) of streets supplied with compressed-gas lamps are perhaps the most satisfactorily lighted of any streets in the city. It is stated, according to the experience of those who have had charge of this branch of municipal administration, that any city contemplating installing a new lighting system will find this type of light the best suited for the illumination of city streets.

LOW-PRESSURE GAS LAMPS.

Twenty-six kilometers (16.15 miles) of Berlin streets are lighted by the so-called low-pressure gas lamps, which are equipped with inverted burners and mantles. These lamps are placed 26 meters (85.3 feet) apart, and on streets of normal width there are approximately 5 lamps within a distance of 300 feet. The inverted lamps, which are suspended from posts 5 meters (16.4 feet) in height, have a power varying from 100 to 400 H. K. (87.7 to 350.88 candlepower), and consume from 0.75 to 1 liter (0.0265 to 0.0353 cubic foot) for each H. K. per hour. A gas mantle used at the present time on the lamps is expected to last about thirty days. They are renewed by workmen, to each of whom is assigned the care of 60 or 70 lamps. One of the advantages of the low-pressure gas lamps is in the use of the inverted burner, by means of which no shadows are thrown downward. This type of lamp does not especially emit the light rays perpendicularly, as its greatest power of radiation is found just below the horizontal of the plane of the flame at an angle between 10 and 45 degrees for the most efficient lamps, while for others the angle is about 60 degrees.

It is impossible to give a definite statement regarding the pressure commonly used in the low-pressure gas lamps, as this varies according to the special make of lamp. An average pressure, however, would be 40 or 60 millimeters (1.57 to 2.3 inches) of water column.

NUMBER AND COST OF GAS LAMPS IN USE.

The total number of gas lamps, including all three types, used in lighting the streets of Berlin amounted to 34,374, according to the annual report of March 31, 1909. This number is classified as follows:

Kind of lamp.	Number.
Common gas:	
One-burner.....	16,184
Two-burner.....	12,162
Three-burner.....	204
Four-burner.....	16
Compressed gas:	
Old type—	
One-burner.....	122
Two-burner.....	648
New type—	
Two-burner.....	760
Three-burner.....	660
Low-pressure gas:	
Two-burner.....	1,954
Three-burner.....	504
Four-burner.....	180

The total care of these lamps requires the service of 487 workmen. In addition there were 141 persons employed in erecting new lamps and in the administrative office. According to the last annual report the repair of damages to lamps cost 30,567 marks (\$7,274.94). There were furnished during the year 328,542 common gas mantles, 215,792 mantles for compressed-gas lamps, and 19,487 mantles for low-pressure lamps. In addition to these supplies, 95,252 gas chimneys and globes were used.

The total consumption of gas for street purposes, according to the report for the fiscal year ending March 31, 1908, was 18,161,152 cubic meters (23,753,746 cubic yards), which amounts to 8.6 cubic meters (11.25 cubic yards) per capita of population. The two large gas companies in this city furnish gas to private consumers for 12.35 pfennigs (2.939 cents) per cubic meter (1.3079 cubic yards). According to this popular rate the amount of gas required for street purposes would have been valued at 1,816,115 marks (\$432,235.37).

ELECTRIC ARC LAMPS.

Twenty-nine of the more important streets of this city, having a combined length of 27.9 kilometers (17.33 miles) are lighted by electric arc lamps. There were at the close of the last fiscal year 1,055 electric arc lamps in use, consisting for the most part of three different types, namely, common arc lamps, intensive arc lamps, and the Nernst lamp. The power of the Steinkohlen arc lamp varies from 500 to 1,500 H. K. (4,388 to 1,315.8 candlepower); that of the Albaikohlen, which has two and one-half times the power of the first, varies from 1,500 to 3,800 H. K. (1,315.8 to 3,333.33 candlepower). These lamps, as a rule, are placed 35 meters (114.8 feet) apart at a height varying from 8 to 18 meters (26.25 to 59.05 feet) above the middle of the street. On Potsdamer Platz, one of the prominent squares in Berlin, Albaikohlen arc lamps having a power of 4,000 H. K. (3,508 candlepower) stronger than any others in use are suspended at this maximum height. Leipziger-Strasse, an important business street, is lighted by arc lamps elevated 8 meters (26.25 feet) above the street, placed 30 meters (98.4 feet) apart. The greatest radiation of electric light rays is at an angle of 45 degrees below the horizontal measured from the plane of the lamp.

The electric power for lighting the streets in Berlin is furnished by a private company. Individual consumers pay 40 pfennigs (9.5 cents) per kilowatt for the current, which is furnished to the city at the rate of 12.83 pfennigs (3.05 cents) per kilowatt. The electric arc lamps consumed a total of 1,708,106 kilowatts. The total number of hours burned during the year, as reckoned for one lamp, was 2,123,171 hours. The following data is given relative to the cost of the electric-lighting system:

Cost of current (1,708,106.5 kilowatts), \$52,155; service and maintenance, \$32,038; administration, \$8,626; total, \$92,819.

BRUSSELS.

By CONSUL-GENERAL ETHELBERT WATTS.

The commune of Brussels, which forms the central part of the city, was lighted by 6,911 gas and 210 electric arc lamps in 1908. The length of time of lighting for the year was 3,843 hours for the gas and

2,200 hours for electricity; 909 gas lamps were extinguished before midnight and all electric lights are extinguished at that hour.

The principal boulevards and streets of the city of Brussels are lighted by gas and electricity, each having its own separate administration. There are in all nine communes in this city similarly lighted and administered.

The central boulevard and the principal one includes the Boulevards du Nord, Anspach, and du Hainaut, connecting the Northern and Southern Railway depots. It is 2,020 meters (6,626 feet) long and 28 meters (92 feet) broad, lighted by 136 combined gas and electric lamps with 136 electric arc lamps and 272 gas lamps (2 gas lamps and 1 electric arc lamp per lamp-post). The distance between each lamp-post is 32 meters (105 feet); there are 3 lamp-posts per 100 meters (328 feet). The height from the pavement level for the electric lamp is 6 meters (19.6 feet) and for the gas lamps 4 meters (13.12 feet).

The gas lamps have incandescent burners with upright mantles (Auer system) with a lighting power of 300 candles per lamp, and for the electric arc lamp 2,000 candles per lamp, using mineralized carbons. The diffusion of gas light is made by radiation and reflection. The exterior glasses are cleaned by hand once a week; the mantles are changed eight times per year and the chimneys two or three times during the same period.

The cost of maintaining the gas lamps is 9.80 francs (\$1.89) per lamp per year, but the commune of Brussels manufactures its own gas, and the by-products of the manufacture (coke, tar, and residues, ammonia, filtering materials, etc.) are sold, and the amount realized from these sales is much more than sufficient to pay cost of gas consumed by the commune, including maintenance of lamp-posts and labor connected therewith.

RUE DE LA RÉGENCE—AVENUE LOUISE.

The Rue de la Régence, which connects the Place Polaert (in front of the palace of justice) with the Place Royale is 580 meters (1,902.8 feet) long and 22 meters (72.2 feet) broad; it is lighted by lamps on 41 posts set at a distance of 31 meters (68.9 feet) apart, or 3 lamp-posts per 100 meters (328 feet). The height from the pavement level is 3.7 meters (12.14 feet). The gas lamp has 3 inverted burners with mantles (Auer system) with a lighting power of 195 candles. The mantles are changed eight times per year and the small chimneys three times during the same period. The cost of maintenance is 13.20 francs (\$2.55) per lamp and per year.

The Avenue Louise, which connects the Woods (Bois de la Cambre) to the Porte Louise is 1,525 meters (4,982 feet) long, and the central part (wooden pavement reserved for carriages and automobiles) 15 meters (49.2 feet) broad, lighted by gas lamps on 114 lamp-posts 27 meters (88.5 feet) apart. There are three lamp-posts per 100 meters (328 feet). The height from the pavement level is 3.1 meters (10.16 feet). The gas lamp has an incandescent burner with upright mantle (Auer system) with a lighting power of 80 candles each. The cost of maintenance is [redacted] lamp and per year.

During the exposition [redacted] lamps, with a lighting power of 2,000 candles [redacted] temporarily, from April to October, on the Avenue [redacted]

LONDON.

By CONSUL-GENERAL JOHN L. GRIFFITHS.

The streets which have been selected for the purposes of this report comprise some of the principal thoroughfares in widely scattered parts of London.

They include streets in the corporation or city of London proper, which cover an area of one square mile, and in which the principal banks, insurance offices, stock exchanges, consular offices, etc., are located; some of the principal streets in the city of Westminster, which is one of the prominent shopping and residential sections of the city; Oxford street, and a portion of Regent street, two streets on which some of the largest retail shops in London are located; Mile End road, and Commercial road, which are representative streets in the east end, or less wealthy part, of London; and also some of the shorter or side streets.

In the city of London proper 52 streets of a total length of 17,083 yards are lighted by electricity, and 6 of a total length of 2,521 yards by high-pressure gas. The only principal street lighted by low-pressure gas is Charterhouse street. The total number of electric arc lamps on these 52 streets is 400. There are 380 open arc lamps and 20 flame lamps fixed upon columns and brackets, all being direct-current lamps. In the open lamps 500 watts are used and in the flame lamps 370 watts. To support these lamps there are 43 central posts, 319 side posts, 36 brackets, and 2 are central suspension without lowering gear. The average distance (not diagonal) between the open lamps is 126 feet, and the average height $18\frac{1}{2}$ feet. The average width of the streets lighted by open lamps is 50 feet. The cost per annum, including interest, depreciation, and all other charges, of the open lamp is \$126.50 and of the flame lamp \$85.16. The open type lamps give approximately half the illumination given by the flame arcs.

EXPERIMENTAL LIGHTING WITH ELECTRICITY.

In the city of London, as the result of a resolution of the court of common council passed on July 25, 1907, permission was granted to the two electric lighting companies having statutory powers in the city to experiment with the newest forms of electric lamps for street lighting in the thoroughfares of Holborn, Holborn viaduct, and part of Old Bailey, the lamps being placed about 20 feet from the ground; a portion of Cannon street, with the lamps at a height of 28 feet; and Farringdon street, with the lamps placed 14 feet from the ground.

There were also placed 11 magazine flame lamps in another part of Cannon street, which were centrally hung and suspended over the roadway by wires attached to the buildings on either side.

In the course of the experiments 22 flame arcs were substituted for a similar number of the original open arcs, while in Farringdon street 18 inclosed arcs were fitted up on special columns in place of the 12 original open arc lamps and columns in that thoroughfare.

The cost per annum of the flame arcs is stated to be \$85.16 each, and of the inclosed arcs, \$60.82 each.

Following are data in reference to the experimental lighting with flame lamps:

	Cannon street.	Holborn street.
Lamps.....number..	11	21
Watts used.....do....	385	370
Supports:		
Central suspension.....do....	11	
Central posts.....do....		6
Side posts.....do....		15
Average distance (not diagonal) between lamps.....feet..	138	135
Average width of street.....do....	50	70
Average height of lamp.....do....	28	20.5
Minimum illumination on or near ground.....candle feet..	.1	.06
Average illumination on or near ground.....do....	.7	.35
Lighting per annum.....hours..	4,280	4,280
Cost per lamp, including interest, depreciation, etc.....	\$85.16	\$85.16

HIGH-PRESSURE GAS LAMPS.

In the city thoroughfares there are 119 high-pressure gas lamps, 42 upright single-burner lamps being placed on brackets in the neighborhood of the Billingsgate fish market. These lamps are said to consume 10 cubic feet of gas per hour and give an illuminating value of 300 candles each, at a cost of \$35.27 per lamp.

They are placed from 60 to 70 feet apart on the diagonal, and the height of the burner from the roadway is about 12 feet. They are placed upon the house fronts, the roadway being from 50 to 60 feet wide. The lamps burn a 10-inch pressure from a special water compressing plant placed in the adjacent pipe subway. The corporation furnishes the compressing plant, services, lamp brackets, and lanterns.

Queen Victoria street is one of the principal streets in the city of London. It has 42 upright 2-burner lamps, which consume about 20 cubic feet of gas per hour, and give lighting equal to 600 candlepower. The annual cost of maintenance for each of these lamps is about \$63.80. They are fixed upon columns on the footpaths, and are placed about 100 feet apart on the diagonal. The burners are 13 feet 6 inches above the roadway, and the street is about 70 feet wide. The lamps burn a 10-inch pressure from a high-pressure trunk main direct from the gas works, the corporation providing the standards and lamps.

Seventeen high-pressure single-burner lamps with inverted mantles have been placed in Fleet street and Chancery lane, which are suspended from brackets on the house fronts. These lamps are about 103 feet apart on the diagonal. The height of the burners from the roadway is from 13 to 16 feet. Chancery lane is 32 feet wide, and Fleet street, which varies from 45 feet to 70 feet in width, has an average width of 50 feet.

These lamps consume 25 cubic feet of gas per hour each, and furnish a light of 1,500 candlepower at an inclusive charge of \$80.29 per annum. They are supplied from special 6-inch high-pressure mains connected with a pressure house in the immediate neighborhood, the pressure being 54 inches, water-gage. The gas company provides the

necessary compressing plants, the men's services, brackets, and lanterns.

There are also a number of high-pressure lamps fitted with upright 2, 3, 4, and 6 burners in various parts of the city at the junctions of roadways. They are of 1,000, 1,300, 2,000, and 3,000 candlepower.

The four city bridges are lighted with high-pressure upright burner lamps, 135 in number, giving 60 candlepower to the foot of gas. They are single-burner lamps, with clusters on the center of the bridges, and have been used for about eight years. The aggregate lengths of the four bridges is about 1 mile, and the widths of the roadways vary from 45 feet to 70 feet.

EXPERIMENTS WITH NEW TYPES—LOW-PRESSURE GAS LAMPS.

A 3-burner inverted high-pressure lamp has been placed in Fleet street, which consumes the same amount of gas, it is stated, as the single burner, and furnishes a like diffusion. The advantage claimed for this burner is that if one mantle should break the remaining two would give a good light until a new mantle should be secured. The annual cost of the 3-burner lamp is about the same as the single burner.

An experimental 4-burner high-pressure lamp has been placed in Queen Victoria street in one of the existing high-pressure lanterns in place of the two upright burners. The consumption of the 4-burners is the same as the upright burners, namely, 20 cubic feet per hour. It is claimed that the candlepower is increased about 50 per cent, namely 45 instead of 30 candles per cubic feet of gas, giving a total of 900 instead of 600 candles. The cost of maintenance is said to be the same.

A specimen of the newest form of lamp with 3 burners has been placed in Fleet street on the existing compressing plant, giving an illuminating value of about 4,400 to 4,555 candles, with a consumption of about 84 cubic feet of gas per hour.

There were 2,640 gas lamps, principally single burners of the upright type, at the close of the year 1908 in use in the city of London, each consuming $4\frac{1}{2}$ cubic feet of gas per hour, and having an illuminating power of 65 to 70 candles.

The side streets are usually so narrow that the lamps are nearly all fixed on brackets about 60 to 70 feet apart at a height of about 12 feet from the roadway to the burner. The annual cost of each lamp, with gas at 58 cents per 1,000 cubic feet, is \$17.07. This cost covers the maintenance of mantles, etc., but does not include capital charges. A few 2, 3, and 5 burner lamps are placed upon standards on the rests in the main roads and squares.

There are only a few 1 and 2 burner low-pressure inverted gas lamps in use in the city of London, with a stated consumption of 4 and 8 cubic feet per hour, and 100 and 200 candlepower, respectively.

The price of gas for public lighting up to midsummer of 1908 was 58 cents per 1,000 cubic feet, and it has since been reduced 6 cents, making the cost now 52 cents per 1,000 cubic feet, with a reduction of the illuminating value of the gas from 16 to 14 candles.

CITY OF WESTMINSTER.

In the following are given data on the street lighting of the principal streets in the city of Westminster: Pall Mall, Piccadilly (Piccadilly Circus to Hamilton place), Regent (Piccadilly Circus to Oxford

Circus), and Victoria (Broad Sanctuary to Vauxhall Bridge road). The number of lights within a block, or within a distance of 200 to 300 feet, varies according to the number of side streets and width of the main street. On Pall Mall the system is principal side lights; Strand, side and central; Piccadilly, side and central; Regent, central (all on refuges), and Victoria, side.

Pall Mall.—Length, 1,780 feet; number of lights, 13; character of lights, ordinary electric arcs, opalescent globes; distance apart, maximum 180 feet, minimum 70 feet; height of lamps to center of illumination, $21\frac{1}{2}$ feet; actual measured candlepower, 900 minimum; diffusion of light, 64 feet, average width of road.

Strand.—Length, 4,060 feet; number of lights, 38; character of lights, ordinary electric arcs, opalescent globes; distance apart, maximum 180 feet, minimum 70 feet; height of lamps to center of illumination, $22\frac{1}{2}$ feet; actual measured candlepower, 587, average for last two quarters; diffusion of light, varying width of road, 65 to 200 feet.

Piccadilly.—Length, 4,050 feet; number of lights, 40; character of lights, ordinary electric arcs, opalescent globes; distance apart, maximum 170 feet, minimum 95 feet; height of lamps to center of illumination, $21\frac{1}{2}$ and $22\frac{1}{2}$ feet; actual measured candlepower, 9 averaged 958 for last two quarters and 31 averaged 475; diffusion of light, 70 feet, average width of road.

Regent.—Length, 2,720 feet; number of lights, 16 (all on refuges); character of lights, flame arcs; distance apart, maximum 212 feet, minimum 146 feet; height of lamps to center of illumination, 24 feet; actual measured candlepower, average 3,575; diffusion of light, 85 feet, average width of road.

Victoria.—Length, 3,130 feet; number of lights, 58; character of lights, 3 c. incandescent gas on refuges and 2 c. incandescent gas; distance apart, averages 110 feet; height of lamps to center of illumination, $14\frac{1}{2}$ feet and 11 $\frac{1}{2}$ feet; actual measured candlepower, 130 and 90; diffusion of light, 77 feet, average width of road.

It is claimed that Regent street furnishes at this time the best example of effective street illumination in greater London.

EAST END OF LONDON.

Mile End road and Commercial road are two of the commanding thoroughfares in the thickly populated east end of London. The length of Mile End road is about 2,185 yards, and of Commercial road about 3,345 yards. There are 47 lamps in Mile End road, and the average distance apart is 159 feet. Commercial road has 59 lamps which are on an average 180 feet apart.

There is an average of 3 lamps in a distance of 300 feet in Mile End road, and an average of 2 lamps in a distance of 200 feet in Commercial road. The height of the light above the pavement level in both these thoroughfares is 24 feet. Only electric light is used, and the lamps are 15-ampere white arc (open type), giving a nominal illumination of 1,300 to 1,400 candles. These are maintained by a staff of men attached to the Stepney borough council's own generating stations. No lowering gear is used for the 15-ampere canopy columns, the trimmers ascending the standards by means of climbing irons.

The average cost of maintenance of a 15-ampere lamp for the year ending March, 1909, was as follows: Current, \$75.76; maintenance, including trimming, repairs, etc., \$22.30; total, \$98.06.

The Stepney borough council has also installed 46 6-ampere flame arcs of 1,300 to 1,400 nominal candlepower, and 68 7-ampere flame arcs of about 2,000 nominal candlepower in some of the other main thoroughfares of the borough. The cost of these lamps for current and maintenance is about \$83.90 per lamp per annum.

BOROUGH OF MARYLEBONE.

In the borough of Marylebone is situated Oxford street, a much-frequented thoroughfare, and a portion of Regent street. The length of Oxford street is 2,200 yards, and the length of the north end of Regent street, the portion within the borough of Marylebone, is 300 yards. The number of lights in Oxford street is 81, and in Regent street 6, while the distance between each lamp is 50 yards. The height of the light from the street or pavement level is 25 feet.

Only electric light is used. The lamps in use are electric flame (yellow) arcs, 10-ampere size, in circuits of 9 at 480 volts, candlepower 1,500. Opalescent globes are used. Until recently two trimmers and two assistants with tower ladders attended to this installation, the cost of attending and repairs being \$1,528 per annum, and carbons \$1,474 per annum. Raising and lowering gear has since been introduced at a cost of \$1,460. The two assistants are therefore no longer required. The saving effected, allowing \$25 for the upkeep of one of the ladders formerly used, is \$730 per annum.

In Oxford street there are 35 2-lamp standards, and 6 center carrier standards with single lamps on island refuges in the center of the roadway, also 5 single-bracket standards on pavements. In Regent street the 6 lamps are erected on 6 center carrier standards on island refuges in center of the road. The general effect is excellent and the street brilliantly lighted.

In the side streets over 2,000 of the gas lamp-posts have recently been connected where electric supply mains were laid near by. The total length of streets lighted is $31\frac{1}{2}$ miles, and the average width 30 feet. Of the posts, 1,159 are fitted with two 35 watts series of burning lamps (supply pressure being 240 volts), giving approximately 60 candlepower; 572 corner posts have two 55 watts series of burning lamps, giving approximately 100 candlepower; and 335 posts in the more important of these streets ($4\frac{1}{4}$ miles long, 36 feet wide) have two 88 watts series burning lamps, giving approximately 150 candlepower.

The lighting committee of the borough of Marylebone is so satisfied with the result of this scheme, which has greatly improved the lighting, and is being done at a cost of \$35,769 per annum, as against \$42,825 formerly paid for gas, that they have decided to connect the remaining 1,300 posts as the mains are extended.

PARIS.

BY CONSUL-GENERAL FRANK H. MASON.

Paris has long been known as one of the best lighted European cities, and the illumination of its streets and public places has been an important and carefully administered function of the municipal government. Although electricity has been introduced in some of the more important streets during the past few years, gas remains by far the most important illuminant for the city at large.

At the close of 1907, the latest date for which official statistics are available for public street lighting, there were in use 1,851 electric arc and 85 incandescent lights, while at the same date there were in service 52,655 gas lamps, of which 1,905 use the ordinary fish-

tail tip and 50,750 are of the incandescent type and employ some species of Auer-Welsbach burner with incandescent mantle and glass cylinder, as chimney, inclosing the flame. Most of the gas street lanterns in use have but one burner, but at certain street corners, and on important centrally located streets, this type is subject to two important variations, namely, either the lantern is of large diameter and is equipped with 2 Welsbach burners set side by side about 6 inches apart, or the lamp-post is branched and carries 3 lanterns of similar size, and hung in line with the length of the street, the middle lantern of each group being of the same size but set about 6 inches higher than the two others for symmetry effect. Lanterns of this kind set in groups of three on branched lamp-posts have uniformly but one burner.

There are besides 4,174 gas lanterns in public streets and near certain properties which are lighted and maintained by the city, but are paid for by individuals or societies who desire and are willing to pay for more than the normal allowance of light in front of their premises. Altogether, therefore, the whole street-lighting system of Paris employs 56,819 gas lanterns of various forms and sizes.

It is calculated that the Auer-Welsbach burner of standard size, which is used in street lanterns throughout the city, should give an illuminating power of 10 candles for every 15 liters of gas consumed per hour. Such a burner consumes an average of 80 liters (about 3 cubic feet) per hour and gives a light of 53 candlepower. In a few prominent squares and open places where the maximum illumination is required Welsbach burners of larger size are used, which consume 100 liters of gas per hour and give a proportionately stronger light, but these are few in number compared with the many thousands of standard 53-candle burners distributed throughout the city. The bat-wing burner used in Paris street lamps gives a light of 11 candlepower for every 140 liters of gas consumed per hour.

COST OF GAS—ELECTRICAL STREET LIGHTING.

Gas for public and private lighting purposes in this city is supplied under contract by the Société de Gaz de Paris, a chartered corporation which receives from private consumers 4 cents per cubic meter (equal to \$1.13 per 1,000 cubic feet), and from the city 3 cents per cubic meter (85 cents per 1,000 cubic feet) for the gas used in municipal lighting.

The total consumption of gas by the city government in 1907 was 32,693,504 cubic meters, or 1,149,503,600 cubic feet, for which the total bill was about \$980,805. This included the lighting of streets and municipal buildings.

The current for electrical street lighting in Paris is supplied partly from the six corporate companies, which divide the territory of the city into "sectors" and furnish electricity for illuminating and motor purposes, and partly from five small generating plants which are owned and operated by the municipality itself. The private companies supply to the city current for 1,461 arc and 85 incandescent electric lamps in streets and public places. The municipal plants furnish electricity for 390 arc lamps, which are located mainly in the corridors and courts of theaters and various municipal buildings.

On certain principal streets, like the Boulevards, the Avenue de l'Opera, and part of the Rue de Rivoli, etc., as will be shown hereafter, electric arc lamps are used in combination with gas lanterns, which latter remain, however, as already stated, by far the more important illuminating device for the streets of Paris.

SOME TYPICAL EXAMPLES—RUE DE LA PAIX.

The Rue de la Paix, the center and mart of fashion in costumes, jewelry, furs, etc., in the French capital, is 350 feet in length and extends from the Place de l'Opera to the Place Vendome. The roadway is 50 feet wide and is paved with wood; the sidewalks vary from 18 to 20 feet in width. The lighting equipment includes 43 three-branch lamp-posts set at the line of the curbstone, 21 on one side of the street and 22 on the other, each of which supports 3 glass lanterns containing 1 incandescent gas burner of the Welsbach type. The lamp-posts are 45 feet apart and are set opposite each other. The posts are of iron cast in decorative patterns and, like practically all other lamp-posts in Paris, are painted first with a warm brown color, which being repainted with a tint of dull dark green gives with time the effect of old bronze. In probably no city in the world are gas posts more artistically modeled and more harmoniously decorated than in Paris.

At the points where the Rue de la Paix is crossed by the Rue Daunou and the Rue des Capucines refuges, or oval stone platforms, 9 inches high, are placed to keep the wheeled traffic in place and enable foot passengers to cross in safety. Each of these platforms has at its center a lamp-post bearing a single gas lantern of the same general type as those of the three-branch posts along the sides of the street. The whole exterior lighting outfit of the Rue de la Paix includes, therefore, 133 single-burner gas lamps of the incandescent type.

Here, as on all the leading shopping streets and boulevards of Paris, great dependence is placed during the evenings upon the blaze of light which pours from the brilliantly lighted windows of shops, stores, cafes, and restaurants, and which illuminates the sidewalks until far into the night. For this reason the street gas lamps, especially on streets which have also electrical arc lights at intervals, are not lighted until late in the evening, thereby securing an important economy to the municipality.

AVENUE DE L'OPERA—AVENUE DES CHAMPS ELYSÉES.

The Avenue de l'Opera is 763 yards in length by 98 feet in width between walls, and extends from the Place de l'Opera to the Place du Theatre Francais. It is a typical modern business thoroughfare, and is one of the most elaborately lighted streets in Paris, in which both electricity and gas are used in combination, with the best effect.

The lighting equipment includes 50 arc lamps with translucent white globes, set upon posts 28 feet high and placed at intervals of 96 to 100 feet along the curbstones on each side of the street. Midway between each pair of these is placed a triple-branch gas lamp-post—33 in all—each bearing 3 lanterns with double Welsbach burners, the height of the posts being such that the gas lamps are about 5 feet

below the level of the line of electric lights, with which they alternate.

Besides these there are in the middle of the avenue, at the several street crossings, 9 refuges for pedestrians, on each of which is placed an electric arc lamp on a post of the same size, height, and model as those along the curb at either side of the street. The whole public-lighting equipment of the avenue, which is about seven-sixteenths of a mile in length, includes 59 electric lamps and 99 gas lanterns with single incandescent burners, mounted on 33 triple-branched posts.

The Avenue des Champs Elysées, the most beautiful and historically interesting thoroughfare in France, if not in Europe, extends from the Place de la Concorde to the Etoile, or Arch of Triumph, and is 1,880 meters (2,056 yards), or approximately $1\frac{1}{4}$ miles, in length. The avenue, including the broad graveled spaces and paved sidewalks, lined with trees on each side, varies in total width from 220 to 280 feet. The roadway, 90 feet wide, is paved with wooden blocks and forms the principal approach to the park, or Bois de Boulogne, one of the attractions of Paris. The avenue is lighted by 146 gas lanterns of the double incandescent burner type, set on posts 18 feet high and placed at intervals of about 90 feet along the curbstone on each side.

At 21 different points, where street crossings occur, two refuges, or oval stone platforms, 9 inches high and 12 feet long, are so placed as to divide the roadway into three sections, the middle one for automobiles, the two outer ones for carriages and wagons. On each of these refuges there is a lamp-post similar to those at the sides of the avenue, bearing a double-burner lamp of the type already described. These number 42, making in all throughout the length of the avenue 188 lanterns, each containing 2 incandescent gas lights, or 376 burners, as the sole public-lighting equipment of the street.

PLACE DE LA CONCORDE—ORDINARY STREETS.

The Place de la Concorde, located at the head of the Garden of the Tuileries and forming an entrance to the Champs Elysées, which was the site upon which the guillotine was first erected during the French Revolution, is now regarded as being the most beautiful and historically interesting open city square in the world. It is 1,181 feet in length by 688 feet in breadth, and has an area of 18.67 acres.

Like the Champs Elysées, it is lighted entirely by gas and the fixtures for this purpose are peculiar and specially designed for that location. They include 20 large iron columns painted to resemble bronze, 30 feet in height, and each bearing on brackets or arms 2 large gas lanterns containing twin burners of the standard incandescent type. Besides these there are 124 lamp-posts of a special and decorative pattern, each supporting a full-sized lantern, inclosing the double incandescent burner above described. The whole lighting equipment of the place includes, therefore, 204 gas lanterns with 408 incandescent burners.

These special descriptions apply to principal streets and places where the standard of illumination is highest, and lamp-posts, lanterns, etc., are most costly and elaborate in construction. But the standard unit of street lighting for ordinary streets, which is employed by tens of thousands throughout the city, is a symmetrical post of cast iron painted to resemble bronze, about 10 feet in height, bearing a

glass lantern with metallic frame and ornamental top, inclosing a single incandescent burner with mantle and glass chimney. They are set on the line of the curbstone, from 130 to 160 feet apart and alternating on opposite sides of the street. The base of the post has a small door which closes with a key, and can be opened to turn on or shut off the gas.

In many of the narrow streets in the central portion of the city, where space is valuable, the lanterns are hung either from brackets attached to the buildings or from bracket posts which are set on the inner edge of the sidewalk against the building and project over the footway at a height of 9 to 10 feet.

There is no part of Paris in which streets are laid out in regular parallel form so as to cross each other systematically at right angles. There is, therefore, no standard block of 200 or 300 feet, as is the case in many American cities. Side streets intersect and cross the main avenues, streets, and boulevards at all intervals and angles, so that the blocks thereby formed are irregular in shape and vary from a flatiron-shaped point to 300 or 400 feet in length.

The distances between lamp-posts, as well as the height of the lantern from the sidewalk, vary according to the width, importance, and general character of the street, the broader the space to be lighted, the more dense the traffic, the shorter the interval between lamp-posts, and the higher the position of the lanterns above the pavement.

VIENNA.

By CONSUL-GENERAL CHARLES DENBY.

The streets of Vienna are, for the greater part, lighted by incandescent gas lamps, only the thoroughfares of importance and the main streets leading to the railway stations being also lighted by electricity.

The entire length of streets lighted by gas is 1,210 kilometers (kilometer = 0.62 mile). There are about 40,000 gaslights throughout the city streets, placed in about 35,000 lamp-posts, which are 18 to 25 meters (meter = 39.37 inches) apart on large thoroughfares and main streets that are closely built up, and from 25 to 35 meters apart on side streets. In streets out of the line of direct traffic and with few or no buildings lamp-posts stand 60 to 90 meters apart, the number of such lights being about 3,700. Lamp-posts for upright incandescent lamps are 3.2 meters in height, the gaslight thus being 3.6 meters above ground. In the vicinity of gardens and in streets with shade trees lamp-posts are shorter in order to avoid running into the branches, the post being 2.25 meters high, with the light 2.6 meters above ground. The two-burner inverted lamps, with hanging incandescent lights, are 4.5 meters above ground.

TYPE AND LIGHTING POWER OF GAS LAMPS.

The lighting power of an upright incandescent lamp is about 70 candlepower. At street crossings and on streets with heavy traffic there are, instead of one-burner lamp-posts, posts with two, three, and four burners, or two-burner inverted lamps with hanging incandescent lights of 110 candlepower for each burner. Small lights of 14

candlepower are at present used only in some small public street urinals.

Of the 40,000 lights about one-half burn half the night, and the remainder all night. Welsbach burners are used in about 33,000 single-burner lamp-posts and in several hundred two, three, and four burner posts. In addition to these there are 116 small burners and 1,761 incandescent lamps burning all night, and 2,082 two-burner inverted lights and 2,403 incandescent lamps burning half the night. The small jet inverted lamps in street urinals are included in the number of Welsbach.

The public lighting of Vienna is done by the Vienna Municipal Gas Works, with 22,625 lights; the Imperial Continental Gas Association, with 11,606 lights; and the Austrian Gaslighting Company, with 3,940 lights. Within the district of the municipal gas works the gas and the installation and maintenance of the street equipment are furnished gratis. Within the lighting districts of the two companies the installation of lighting plants for Welsbach burners is done at the expense of the companies, but for maintenance the municipality allows \$8.53 per Welsbach burner burning half the night and \$13.40 per Welsbach burner burning all night. In the installation of inverted lights by these companies the lamp-posts and lamps are furnished by the municipality and a bonus of \$4.06 per lamp-post paid by it for erection. The yearly cost for gas consumption is \$9.13 for inverted lamps burning half a night and \$14.21 for lamps burning all night, which is charged to the municipality.

Recently compressed-gas lamps have been on trial in Vienna to obtain experience regarding such a plant. Compressed-gas installations will, owing to the heavy cost of maintenance, be installed only in rare cases, as the electric arc-lamp lighting is preferred for big light effects, owing to operating considerations, the electric current being furnished by the municipal works.

On several streets at the border of the town, to which gas has not yet been piped, the public lighting is done by petrol lamps or gasoline incandescent lamps, but the municipality is endeavoring to have these replaced by gaslights as soon as possible.

NUMBER AND CHARACTER OF ELECTRIC LIGHTS.

Electric lights have been installed on some of the main thoroughfares of the city, namely, the Ring, the Franz Josefs-Quai, Kärnthnerstrasse, Rothenthurmstrasse, Graben, Kohlmarkt Hof, Freyung, Schwarzenberg and Karlsplatz, Mariahilferstrasse up to Schönbrunn, Praterstrasse, Währingerstrasse, Alserstrasse, and others.

These streets, with a combined length of about 36 kilometers, are lighted by 1,155 arc lamps and 947 glow lamps. The medium distance between these lamps is about 31 meters and varies between 18 and 42 meters, according to whether or not the lamp-posts are situated on busy spots. On an average, there are two or three lamps within a distance of 60 to 90 meters. The height of the lamps above street level is 10 or 12 meters, according to whether the lamps have 12 or 15 amperes. Broader streets and big places are lighted with arc lamps of 15 amperes and about 2,500 candlepower, while narrower streets have arc lamps of only 10 amperes and 1,700 candlepower. The lamps are covered by ground-glass globes absorbing a great part of

the light, so that, in fact, they give only 1,700 effective candlepower with 15-ampere lamps of 2,500 candlepower, and 1,200 candlepower instead of 1,700 with 12-ampere lamps. This loss is accepted for the reason that ground-glass globes diffuse the light more regularly, while plain glass globes not only diffuse the light irregularly, but also dazzle the eyes of passers-by.

The basis for diffusion of light is a radius of 17 to 20 meters for lamp-posts 12 meters high, and 14 to 18 meters for lamp-posts 10 meters high. The public electric lights of Vienna are fed from the cable system of the municipal electric works. There is direct current of 220 volts on the nine inner and the greater part of the outside districts. This voltage permits series of 5 lamps, so that every fifth lamp-post is a switch post. Moreover, every second post in a street belongs to a different series, so that even if one series fails the streets will be lighted, but only by half the number of lamps.

GAS USED TO SUPPLEMENT ELECTRIC LIGHTING.

As the arc lamps burn only until midnight, there are two arms for incandescent gaslights, to be used after midnight, on lamp-posts near police stations, emergency hospitals, street corners, etc. Streets lighted by electricity also have to a certain extent gaslights to illuminate dark corners caused by the shadows of big objects on the streets, like monuments, tramway stations, trees, etc., but principally to light the streets after midnight. The annual cost of lighting is \$92.77 per 15-ampere lamp, inclusive of care and maintenance, and \$74.10 per 12-ampere lamp, which amount the municipality of Vienna has to pay to the municipal electric works. The actual cost to the municipal electric works is, of course, much lower.

In general, it has been found that an electric light plant will work the more economically the larger the electric unit employed. Strong lamps hanging high up and illuminating a wide circuit will furnish a uniform and diffused light, so as to make all objects on a street visible from a great distance. They also prevent the encumbrance of the streets with a great number of lamp-posts.

[There are on file in the Bureau of Manufactures for inspection and consultation various photographs, drawings, catalogues, etc., forwarded by the consuls in connection with the foregoing reports on street lighting.]





